

EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	7175	slope with sample	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 09:03
L2	28970	kaiser	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 09:03
L3	62	1 and 2	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 09:09
L4	20974	path adj1 select\$3	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 09:59
L5	59	1 and 4	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 10:43
L6	2	2 and 5	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 09:59
L7	1681528	curv\$3 or slop\$3	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 10:04
L8	49975	sample with 7	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 10:04
L9	0	"375"/.\$.	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 10:43
L10	68708	"375"/\$.cccls.	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 10:43
L11	0	8 and 9	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 10:43

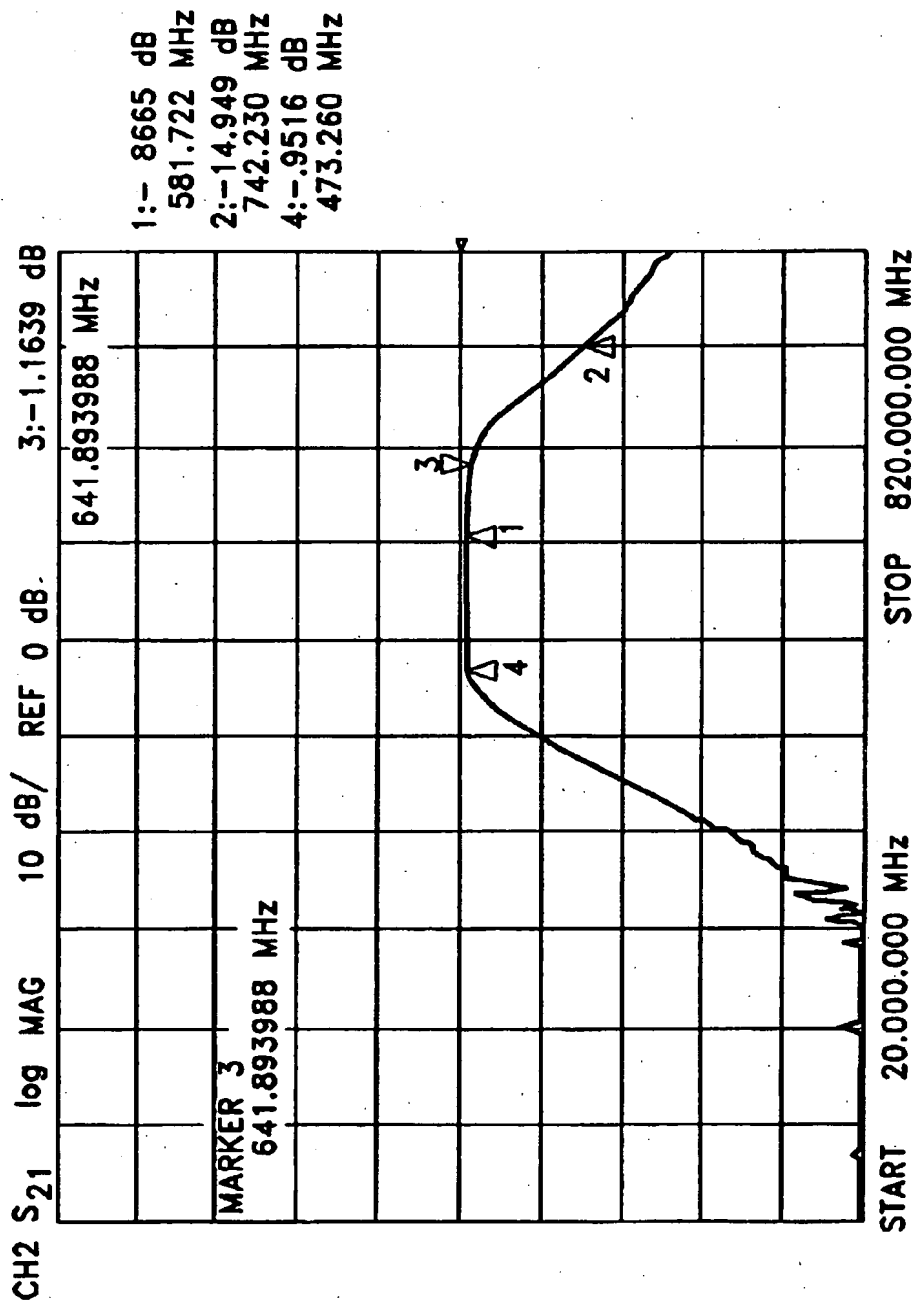
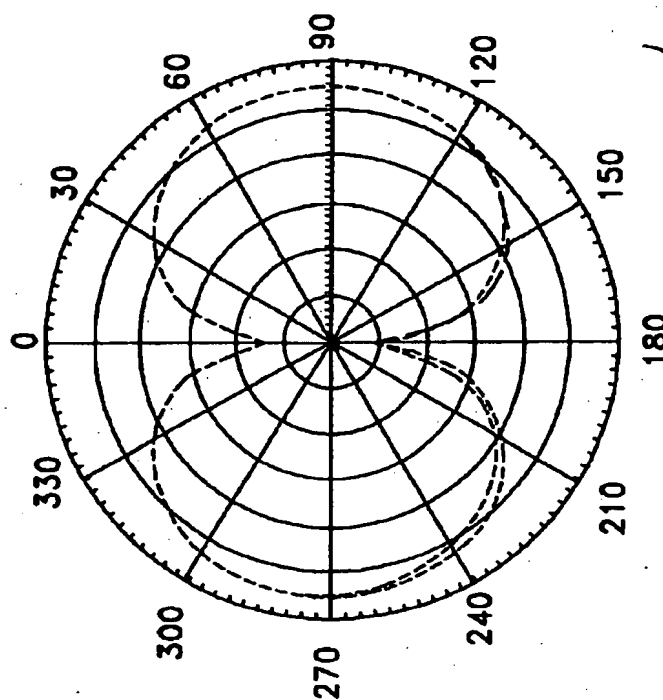


FIG. 15

EAST Search History

L12	561	8 and 10	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 10:44
L13	460	12 and (@ad<="20030630")	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 11:07
L14	429565	gps	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 10:46
L15	19	13 and 14	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 11:05
L16	537255	amplitude	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 11:05
L17	291	1 with 16	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 11:06
L18	0	14 and 17	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 11:06
L19	15011	up adj2 sampl\$3	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 11:06
L20	163	19 same 8	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 11:07
L21	122	20 and (@ad<="20030630")	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 11:11
L22	1	21 and 14	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 11:07
L23	2	"7095813".pn.	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 12:43

Antenna Directivity Pattern [dB] at 700 MHz



Antenna Directivity Pattern [dB] at 700 MHz

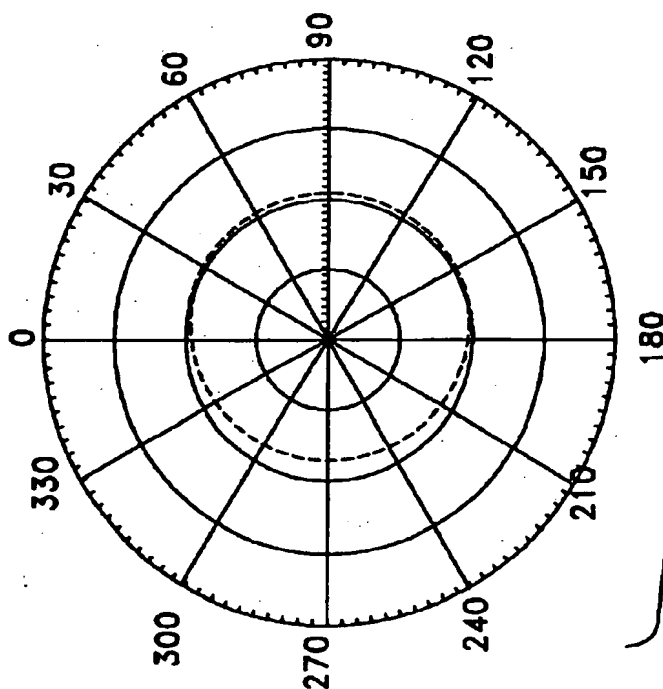


FIG. 16

EAST Search History

L24	4474	path adj2 search\$3	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 12:44
L25	7	1 and 24	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 12:44
L26	3	14 and 25	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 12:44

RADIO FREQUENCY DEVICE FOR RECEIVING TV SIGNALS AND GPS SATELLITE SIGNALS AND PERFORMING POSITIONING

RELATED APPLICATIONS

This application claims the benefit of U.S. Provisional Patent Application Ser. No. 60/361,762, "DTV Position Location Augmented by GPS," by James J. Spilker, filed Mar. 4, 2002; U.S. Provisional Patent Application Ser. No. 60/341,922, "An Inexpensive Hardware and Signal Processing Technique for Tracking Television Signals in a Mobile Handheld Device," by Matthew Rabinowitz, filed on Dec. 18, 2001; U.S. Provisional Patent Application Ser. No. 60/353,440, "DTV Position Location Augmented by GPS," by James J. Spilker, filed Feb. 1, 2002; U.S. Provisional Patent Application Ser. No. 60/332,504 "DTV Augmented GPS for Robust Aircraft Navigation," by James J. Spilker, filed Nov. 13, 2001, the disclosures thereof are incorporated by reference herein in their entirety.

Initially devised in 1974, GPS is widely used for position location, navigation, surveying, and time transfer. The GPS system is based on a constellation of 24 on-orbit satellites in sub-synchronous 12 hour circular, inclined orbits. Each satellite carries a precision atomic clock and transmits a pseudo-noise signal, which can be precisely tracked to determine pseudo-range. By tracking 4 or more satellites, one can determine precise position in three dimensions in real time, world-wide. More details are provided in B. W. Parkinson and J. J. Spilker, Jr., Global Positioning System-Theory and Applications, Volumes I and II, AIAA, Washington, D.C. 1996.

GPS has revolutionized the technology of navigation and position location. However in some situations, the effectiveness of GPS is limited because the GPS signals are transmitted at relatively low power levels (less than 100 watts) and over great distances, the received signal strength is relatively weak (on the order of -160 dBW as received by an omni-directional antenna). Thus the signal is marginally useful or not useful at all in the presence of line-of-sight blockage or while the receiver is inside a building.

In recent years, there has been a rollout of digital television in Asia, Europe and the Americas. Some of the primary standards around the world are ATSC (e.g. United States), DVB (e.g. Europe) and ISDB (e.g. Japan). As of February 2001, approximately 1200 DTV construction permits for US DTV stations had been acted on by the FCC. Over 1600 DTV transmitters are expected in the United States. Other regions are implementing similar DTV systems. The Japan Broadcasting Corp. (NHK) has defined a terrestrial DTV signal for Japan, referred to herein as the Integrated Services Digital Broadcasting-Terrestrial (ISDB-T) signal. These new DTV signals permit multiple TV signals to be transmitted in the assigned 6 MHz radio channel. All of these different television standards employ an embedded synchronization code which is used to probe the transmission channel and mitigate the effects of multipath in a digital TV receiver. In order to be effective for channel modeling and multipath mitigation, these synchronization codes have wide bandwidths, narrow time autocorrelation functions, and high power levels. The above-stated features make the synchronization codes ideal for positioning, in particular indoors where multipath effects are severe and GPS signals may not penetrate. In addition, analog television broadcasts have also started in recent years to insert into their broadcasts a synchronization code termed the Ghost-Canceling Reference (GCR), which is used for multipath mitigation on analog signals in TV receivers that digitize the signal. Consequently, the GCR can also be used for precise ranging. Other test signals inserted in the analog broadcasts, such as the multiburst signal, may also be used for position determination.

There is a proposed system for using conventional analog National Television System Committee (NTSC) television signals to determine position. This proposal is found in a U.S. Patent entitled "Location Determination System And Method Using Television Broadcast Signals," U.S. Pat. No. 5,510,801, issued Apr. 23, 1996. However, the technique described the use of the horizontal and vertical synchronization pulses which were intended only for relatively crude GPS signals for position determination and data reception. The present invention relates generally to position determination and data reception, specifically to a radio frequency device that enables reception of television and/or GPS signals for position determination and data reception.

FIELD OF THE INVENTION

This application hereby incorporates by reference in its entirety the following documents: 1) B. W. Parkinson and J. Spilker, Jr., Global Positioning System-Theory and Application, Volumes I & II, AIAA, Washington, D.C. 1996, and 2) J. Spilker, Jr., Digital Communications by Satellite, Prentice-Hall, Englewood Cliffs, N.J., 1977, 1995.

INCORPORATION BY REFERENCE

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